

On some Ethiopian species of the genus *Coccus* (Homoptera: Coccoidea: Coccidae).

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This paper deals with the identity of a small group of soft scales occurring in the Ethiopian region. Most of them are of economic importance as they attack cultivated plants on which, at times, they cause serious damage.

The species included were chosen among those that in the writer's opinion are all clearly referable to the genus *Coccus* as it is currently understood.

The genotype — *C. hesperidum* L. — has been omitted because from the material at hand it is not yet possible to fix the real range of variation of some structures.

Altogether thirteen apparently valid species are reviewed and a provisional key to separate them is as follows:

- a) ventral side of body always provided with some tubular ducts
 - b) legs with an articulatory sclerosis between tarsus and tibia
 - c) dorsum with a group of tubercle-like pores in front of anal plates
 - d) tubular ducts numerous and arranged in five submedian groups **caudatus** (Green)
 - dd) tubular ducts very few about genital opening only
subhemisphaericus (Newstead)
 - cc) tubercle-like pores in front of anal plates absent
 - e) anal plates together about as long as wide
 - f) antennae with 7 joints . . . **viridis** (Green)
 - ff) antennae with 8 joints **africanus**
(Newstead)
 - ee) anal plates about twice as long as their combined width **mangiferae** (Green)
 - bb) legs without articulatory sclerosis
 - g) multilocular disc pores set in a small group about genital opening **subacutus** (Newstead)
 - gg) multilocular disc pores absent . . . **bicruciatius** (Green)
 - aa) tubular ducts on ventral dermis absent

- h) dorsal setae all short and widely scattered
 - i) tubercle-like pores present in front of anal plates
 - j) dorsal setae cylindrical . . . **acutissimus** (Green)
 - jj) dorsal setae conical or finely setolose
 - k) multilocular disc pores extending as far as mesothorax **ehretiae** (Brain)
 - kk) multilocular disc pores about the genital opening and preceding segment only
 - l) setae of marginal fringe finely pointed or slightly fimbriate at apex . . . **elongatus** (Signoret)
 - ll) setae of marginal fringe stout and somewhat swollen apically . **pseudelongatus** (Brain)
 - ii) tubercle-like pores absent **sordidus** sp. n.
 - hh) dorsum with some setae long and arranged in three longitudinal fringes **oculatus** (Brain)

Coccus acutissimus (Green).

This species has been twice recorded from Mauritius by Mamet (1943, 1949). The specimens at hand are from Kenya where the species is apparently restricted to the coastal districts. Local specimens agree well with Green's (1904) and Ferris' (*in*: Zimmerman, 1948) descriptions and figures.

KENYA. Mombasa: 24.v.1951 on leaves of *Anacardium occidentale* L. and of *Cocos nucifera* L. (*R. H. Le Pelley*).

Coccus africanus (Newstead) (fig. 1).

Originally it was described by Newstead (1898) as a variety of *viridis* Green from specimens infesting coffee in Lagos (Southern Nigeria). Some years later on examining material from Uganda, also living on coffee, the same author (Newstead, 1917) came to the conclusion that the differences were important enough to justify a specific rank.

The species is redescribed from a long series of specimens collected on various host plants in Eastern Africa.

Body elongate to broadly oval; flat to moderately convex; surface smooth; colour uniformly light green. Mounted specimens up to 4.7 mm. long and up to 2.9 mm. wide. Dorsal dermis at maturity soft, without areolate pale areas. Tubercle-like pores anterior to anal plates absent. Dorsal setae small, cylindrical, widely distributed. Anal plates together slightly wider than long, with posterior-lateral margin rounded and with three or four small apical setae. Submarginal tubercles no more than two on each side, at times missing altogether. Setae of marginal fringe small, pointed or slightly fimbriate at apex. Stigmatic spines three of which median about three times as long as

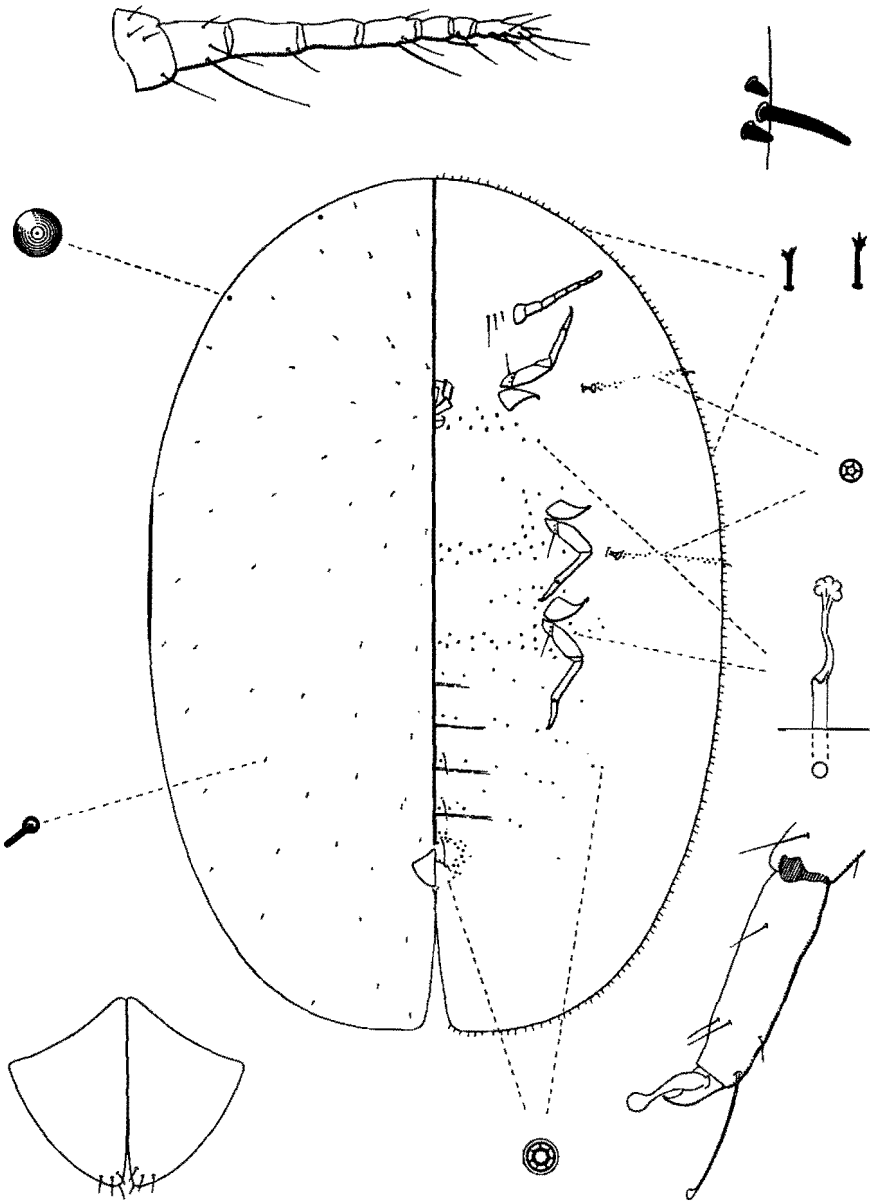


Fig. 1. *Coccus africanus* (Newstead).

laterals. Ventral dermis with numerous multilocular disc pores near genital opening and extending in loose transverse rows as far as metathorax. Quinquelocular pores associated with stigmatic openings few and arranged in an irregular single pore band. Tubular ducts moderately numerous near attachment of all legs and on median area of meso- and metathorax. Antennae with eight joints. Legs all well developed with an articular scleritis between tarsus and tibia. Fold of anal invagination with four setae.

The material studied was as follows:

KENYA. Mitubiri: 9.xi.1937 on *Coffea arabica* L. (R. H. Le Pelley); Nairobi: 1.xii.1950 on *Gardenia* sp. (M. S. Nattrass); 9.i.1951 on *Coffea arabica* L. (G. De Lotto); 15.iii.1951 on *Coffea robusta* Lind. (do.); 20.vi.1951 on *Ehretia silvatica* Guerke (do.); 24.viii.1951 on *Carissa edulis* Vahl, *Gymnosporia* sp. and *Psidium guajava* L. (do.); Teita: 18.viii.1954 on *Coffea arabica* L. (P. A. Jones).

UGANDA. Mwera: 13.iv.1953 on coffee (C. C. Gowdey).

ERITREA. Asmara: 6.iii.1953 on *Carissa edulis* Vahl (Andemeschiel Tuoldehaimanot); Faghenà: 27.v.1952 on *Citrus limonia* Osbeck (V. Nastasi).

Structurally *C. africanus* is very closely allied to *viridis* (Green) from which it differs by having 8-jointed antennae, more abundant tubular ducts (some of which are always associated with the fore legs) and by the absence of any areolate pattern on the dorsal dermis. Newstead (1917) in his additional descriptive notes pointed out that — although rarely — specimens with 7-jointed antennae also occur and in well stained adults the dorsum is marked by small pale areas. These variations if confirmed would render void the differences from *viridis* with which consequently it would have to be synonymized. As in all specimens at hand the differences are constant the two species are here retained as distinct.

It appears from observations by the writer in Eastern Africa that *C. africanus* only occurs in inland areas over 3000 or 4000 ft. altitude, where it often ranks as an important pest, particularly on coffee and citrus*).

* Going through the literature of the coffee green scale in East Africa, there is evidence that there was some confusion in the past about the identity of the real species involved. Probably the confusion was originated by Newstead (1910) who first identified the local species as *viridis* and rectified his diagnosis only seven years later (Newstead, 1917). Gowdey (1913, 1917) listed *africanus* and *viridis* as both occurring in Uganda. Specimens from a lot originally collected by him and presumably identified by Newstead as *viridis* have been examined and found similar to *africanus*. Lindinger (1913) in his papers on Coccids of Tanganyika mentioned *viridis* on coffee in Meru. Evidently he did not see any local material as he simply transcribed one of Morstatt's records (1913). Anderson (1914) at first noticed *africanus* and *viridis* as both occurring on coffee in Kenya, but the following year (Anderson, 1915) he pointed out that having examined specimens from all parts of the coffee growing areas, *viridis* was not actually found and recorded the species as *africanus*. Even in Belgian Congo, although generally known as *viridis*, the species was recognized by Mayné and Ghesquière (1934) to be actually *africanus*.

***Coccus bicruciatu*s (Green) (fig. 2).**

The present record is the first from the whole Ethiopian region. Although types of this species have not been seen, the writer has no doubt that the material at hand belongs to the species described by Green (1904) from Ceylon, as local specimens agree well with his detailed description and figures.

Living adults „ochreous; median area suffused with bright castaneous; margin narrowly brown. Form oval or subdeltoid; anterior extremity usually more or less acuminate. Flattish; with a prominent median longitudinal and two transverse carinae; the longitudinal ridge obsolescent posteriorly to the second transverse ridge” (Green, *loc. cit.*). Mounted specimens up to 4.7 mm. long; up to 2.1 mm. wide. Body asymmetrical, often distorted in relation to position on host plant. Dorsal dermis at maturity moderately chitinized with some irregularly shaped pale areas on submedian area of postsoma, each of which encloses a variable number of flat tubercle-like pores. Dorsal setae very small, spiniform, rather abundant. Anal plates elongate with anterior- and posterior-lateral margins fused and forming a continuous curve; combined width about two thirds of length; setae four, one apical, one subapical and two inserted on internal margin; all slender. Submarginal tubercles absent. Setae of marginal fringe set close, curved and dilated apically. Stigmatic spines inserted dorsally, three, of which median about twice as long as laterals, all stout; stigmatic cleft with a large deeply chitinized rim. Multilocular disc pores entirely lacking. Quinquelocular pores arranged in a band two pores wide. Tubular ducts rather few and set all around genital opening only. Antennae with 6 joints. Legs all well developed but rather small, without articulatory sclerosis between tarsus and tibia. Setae on fold of anal invagination four.

KENYA. Gazi: 24.ii.1951 on *Mangifera indica* L. (R. H. Le Pelley); Mombasa: 1.ix.1951 and 28.iv.1953 on *Mangifera indica* L. (do.).

ZANZIBAR: 13.ii.1956 on *Citrus* sp. (R. H. Le Pelley); 11.ii.1956 on clove tree (do.).

***Coccus caudatus* (Green) (fig. 3).**

Ritchie's record (1929) of *C. caudatus* from Tanganyika on *Coffea robusta* is the only one ever published from the Ethiopian region. The few specimens at hand used for the redescription and accompanying figure are also from *Coffea robusta* as well as from *C. arabica* and were compared at the British Museum (Natural History), London, with Green's types).

Adult female broadly oval, strongly convex at maturity, colour castaneous with marginal area darker, almost black; from anal opening emerge two to four long threads of white glassy wax. Length of mounted specimens up to 4.2 mm., breadth up to 2.7 mm. Dorsal dermis at full maturity moderately

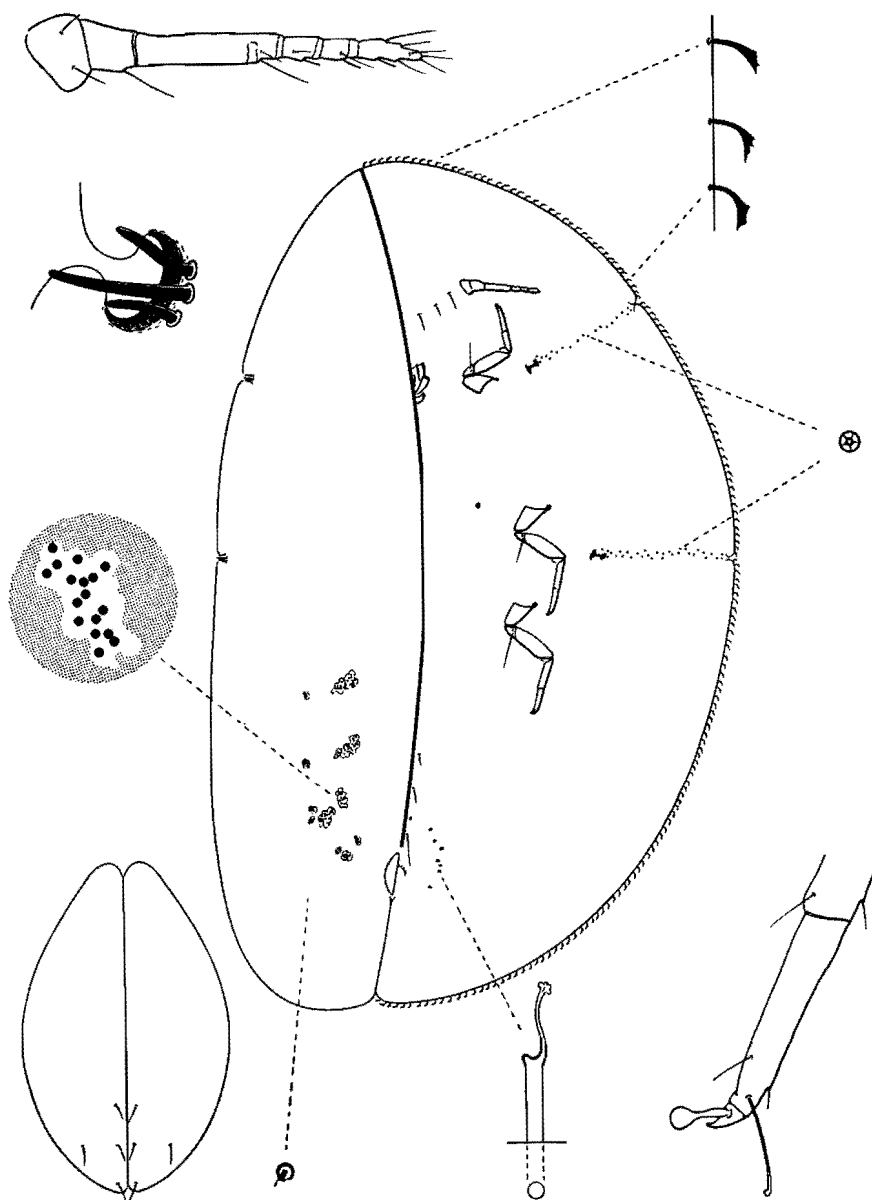


Fig. 2. *Coccus bicruciatatus* (Green).

to rather strongly chitinized especially along the margin and marked by small oval pale areas having at the centre a minute pore. Dorsal setae slender cylindrical, widely scattered. Tubercle-like pores few, set in front of anal plates. Anal plates quadrate with three or four small apical setae, one of which is similar to those of marginal fringe. Submarginal tubercles absent. Marginal setae rather short, broadly dilate and fimbriate apically and set at fairly wide intervals. Stigmatic spines three, of which the median about two to three times as long as laterals. Ventral dermis with numerous multilocular disc pores arranged in segmental rows as far as mesothorax. Quinquelocular pores associated with stigmatic openings numerous and set in a band two pores wide. Tubular ducts stout, very numerous and crowded in five groups on submedian area near attachment of antennae and legs. Antennae 7-jointed. Legs all well developed with an articulatory sclerosis between tarsus and tibia. Fold of anal invagination with four setae.

KENYA. Nairobi: 25.iv.1951 and 23.vi.1951 on *Coffea robusta* Lind. (G. De Lotto).

UGANDA. Toro: 18.viii.1951 on *Coffea arabica* L. (D. J. McCrae).

Although widely distributed in East Africa, *C. caudatus* is rare. Infestations observed by the writer were limited to a few scattered individuals.

***Coccus elongatus* (Signoret).**

= *Lecanium acaciae* Newstead 1917, new syn.

= *Lecanium wistariae* Brain 1920, new syn.

An adequate redescription of *C. elongatus* (Signoret) has been recently published by Ferris (*in*: Zimmerman, 1948). According to him in this species there are "apparently" no tubercle-like pores in front of the anal plates. In all specimens from Kenya as listed below and in many others from various parts of the Ethiopian region and California, U.S.A., examined in connection with this paper, the tubercle-like pores are always present. Their number ranges from a few up to about 40. Normally they are very small, flattish or slightly convex so that they might be overlooked or confused with the minute pores situated at the centre of the areolate pale areas. In every other structure the material at hand agrees well with Ferris' diagnosis.

In 1917 Newstead described *Lecanium acaciae* from specimens attacking *Acacia melanoxylon* and *Albizia moluccana* in Nairobi, Kenya. An accurate study of material from the type locality and the type host plants led to the conclusion that Newstead's species shows no morphological differences from *elongatus*, with which it is here synonymized. Five types of *Lecanium wistariae* described by Brain (1920) from another leguminous plant of the genus *Wistaria* in South Africa were examined and found structurally identical with Signoret's species and consequently *L. wistariae* too is to be regarded as a new synonym of *elongatus*.

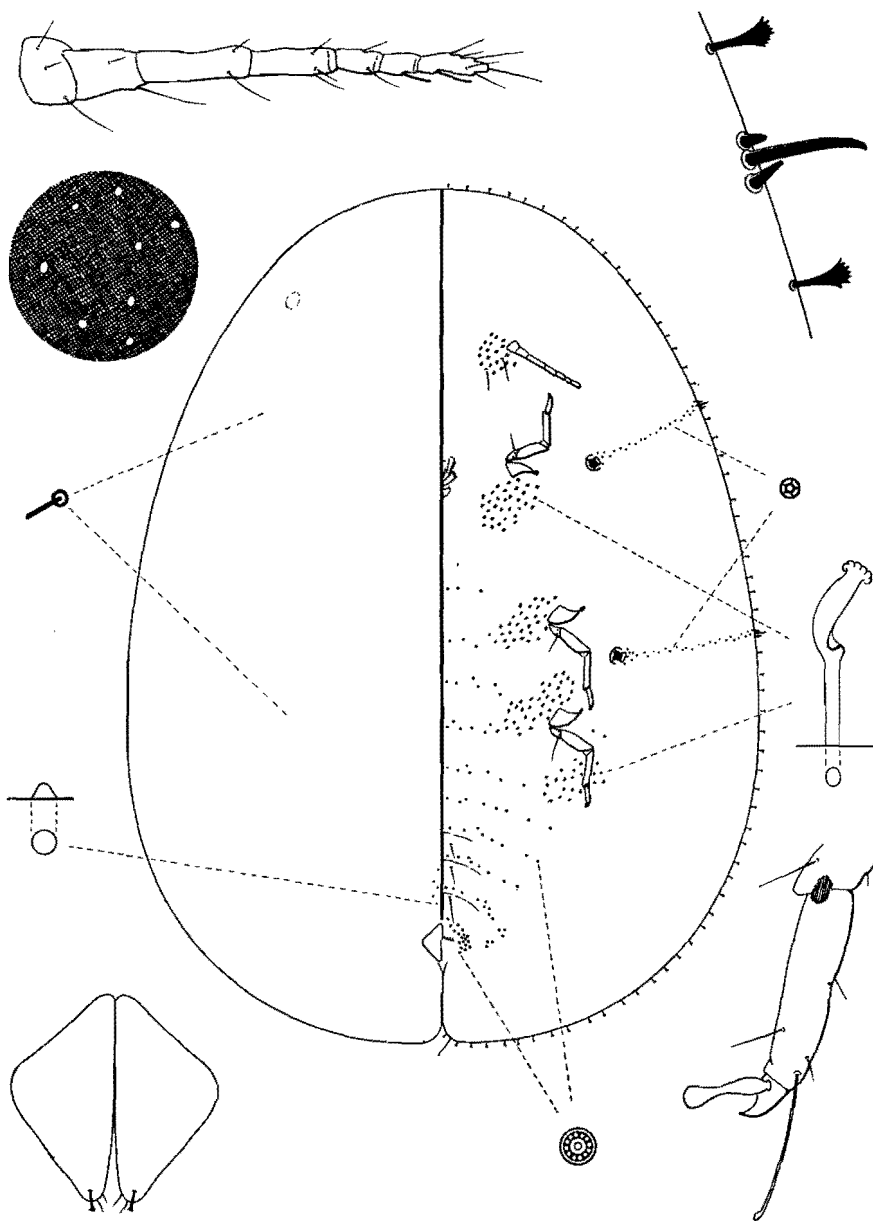


Fig. 3. *Coccus caudatus* (Green).

The material examined was as follows:

KENYA. Nairobi: February 1942 on an unknown plant. (R. H. Le Pelley); 9.i.1951 on *Dalbergia assamica* Benth. (G. De Lotto); 16.iii.1951 on *Pueraria thunbergiana* Benth. (G. M. Lavers); 9.iii.1951 on *Cajanus cajan* (L.) Millsp. (G. De Lotto); 11.vii.1951 on *Annona squamosa* L. (do.); Thompson's Falls: 21.ii.1952 on *Acacia melanoxylon* R. Br. (J. M. C. Gardner); Nairobi: 31.iii.1953 on *Ficus* sp. (G. De Lotto); Ruiru: 15.viii.1953 on *Dolichos* sp. (D. J. McCrae); Machakos: 4.viii.1956 on *Acacia seyal* Del. (G. De Lotto); Kisumu: 28.v.1956 on *Caesalpinia decapetala* (Roth.) Alston (T. J. Crowe).

SOUTH AFRICA. Pretoria: 10.ii.1957 on *Acacia* sp. (G. De Lotto).

***Coccus ehretiae* (Brain) (fig. 4).**

This species is known only from the original description (Brain, 1920). The following diagnosis is based on eight specimens of the type series.

"Adult female somewhat similar to *L. hesperidum* but rather less convex and much darker in colour, dark brown to blackish, 3.6 mm. long by 1.8 mm. broad, regularly oval" (Brain, *loc. cit.*). Body rather broadly elliptical, with dorsal dermis moderately chitinized at maturity and marked by small roundish or oval pale areas, each having a minute pore in the centre. Tubercle-like pores flat, with granulate surface, set in a group of 6 to 10 in a fairly regular line in front of anal plates. Dorsal setae fairly stout and finely pointed. Submarginal tubercles 2 to 5 on each side. Anal plates together as wide as long with a subdiscal stout seta and two slender apical ones. Setae of marginal fringe noticeably longer than median stigmatic spines, stout, pointed apically and set rather closely. Stigmatic spines three; median about three times as long as laterals. Ventral dermis with few disc pores of quinquelocular type about genital opening and extending as far as mesothorax. Quinquelocular pores associated with stigmatic opening arranged in an irregular single pore band. Tubular ducts entirely absent. Antennae with 7 or 8 joints; in 7-jointed antennae one joint partially divided by a pseudoarticulation. Legs all well developed and having an articulatory sclerosis between tarsus and tibia. Fold of anal invagination with 5 or 6 setae altogether.

SOUTH AFRICA. Pretoria: October 1914 on *Ehretia ottentottica* Burch. (C. K. Brain).

***Coccus mangiferae* (Green).**

Previously known only from Seychelles Islands (Green, 1916), Mauritius (Mamet, 1943, 1949) and Madagascar (Mamet, 1951). Local specimens were compared at the British Museum (Natural History), London, with Green's types. It should be noted that the species is provided with a group of a few tubular ducts situated on the meso- and metathorax which have been omitted

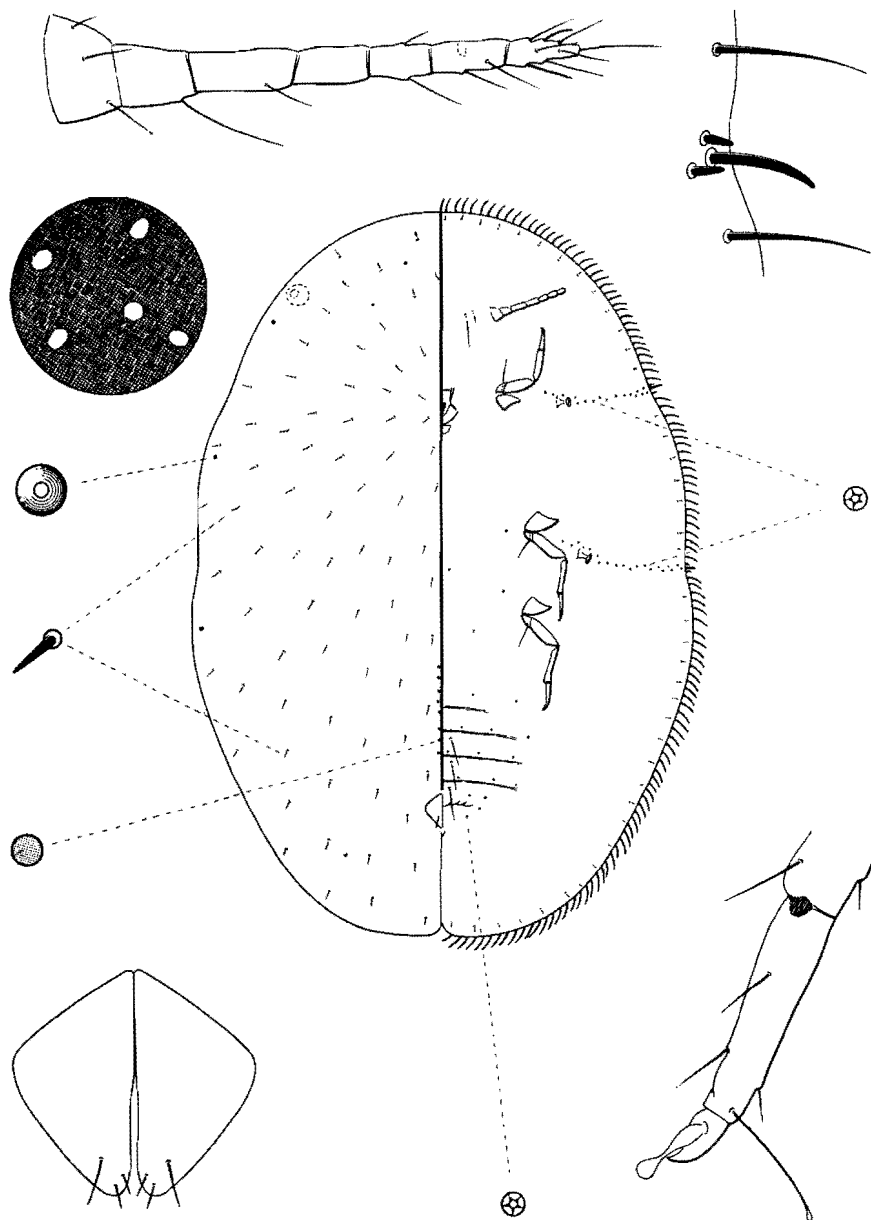


Fig. 4. *Coccus ehretiae* (Brain).

in the redescription and illustration recently published by Ferris (in: Zimmerman, 1948).

KENYA. Mombasa: 28.iv.1953 on *Mangifera indica* L. (P. E. Wheatley).

ZANZIBAR: 11.ii.1956 on clove tree (R. H. Le Pelley).

***Coccus oculatus* (Brain) (fig. 5).**

Originally described by Brain (1920) under *Saissetia*. In 1938 Green and Mamet described *Lecanium dorsociliatum* from specimens attacking *Nephrolepis cordifolia* in Mauritius, which later Mamet (1954) recognized to be a synonym of Brain's species. Hall (1935) recorded *oculatus* from Southern Rhodesia as living on *Grevillea robusta*.

The following redescription was made on specimens from Kenya which were compared with Brain's types in Pretoria. The specimen illustrated is a young adult female collected on *Vitis vinifera* L.

Body very elongate elliptical; flat to moderately convex; colour uniformly dull brown. Mounted specimens up to 8 mm. long and 4 mm. wide. Dorsal dermis at maturity rather thick, fairly chitinated and marked by numerous very small oval pale areas. Tubercle-like pores very small, strongly convex and set in a group of 12 to 21 along median line in front of anal plates. Dorsum with numerous stout, finely pointed setae about twice as long as those of margin arranged in three longitudinal fringes on median area; a few very small apically frayed setae widely scattered. Submarginal tubercles 6 to 9 on each side. Anal plates together somewhat longer than wide, acutely pointed posteriorly with a subdiscal and two apical setae. Setae of marginal fringe longer than median stigmatic spines, slightly frayed at apex and closely set. Stigmatic spines three of which median about twice as long as laterals. Ventral dermis with a few multilocular disc pores about genital opening and extending as far as metathorax. Quinquelocular pores arranged in a band two or three pores wide. Tubular ducts absent. Antennae 8-jointed. Legs all well developed, rather slender and provided with an articulatory sclerosis between tarsus and tibia. Fold of anal invagination with six setae.

KENYA. Nairobi: 26.ii.1951 on *Bauhinia purpurea* L. (G. De Lotto); 11.vii.1951 on *Annona muricata* L. (do.); Endebess: 28.iv.1956 on *Vitis vinifera* L. (A. L. Norman).

***Coccus pseudelongatus* (Brain) (fig. 6).**

The following redescription was made on eight type specimens of Brain's collection examined in Pretoria (South Africa).

"Adult female similar to *elongatum* but slightly less convex and darker in colour" (Brain, 1920). Body rather elongate elliptical. Dorsal dermis at maturity moderately chitinated and marked by small oval or circular pale areas. Tubercle-like pores small, more or less hemispherical and set in a group of 20 to 30 in front of anal plates. Dorsal setae not numerous, finely

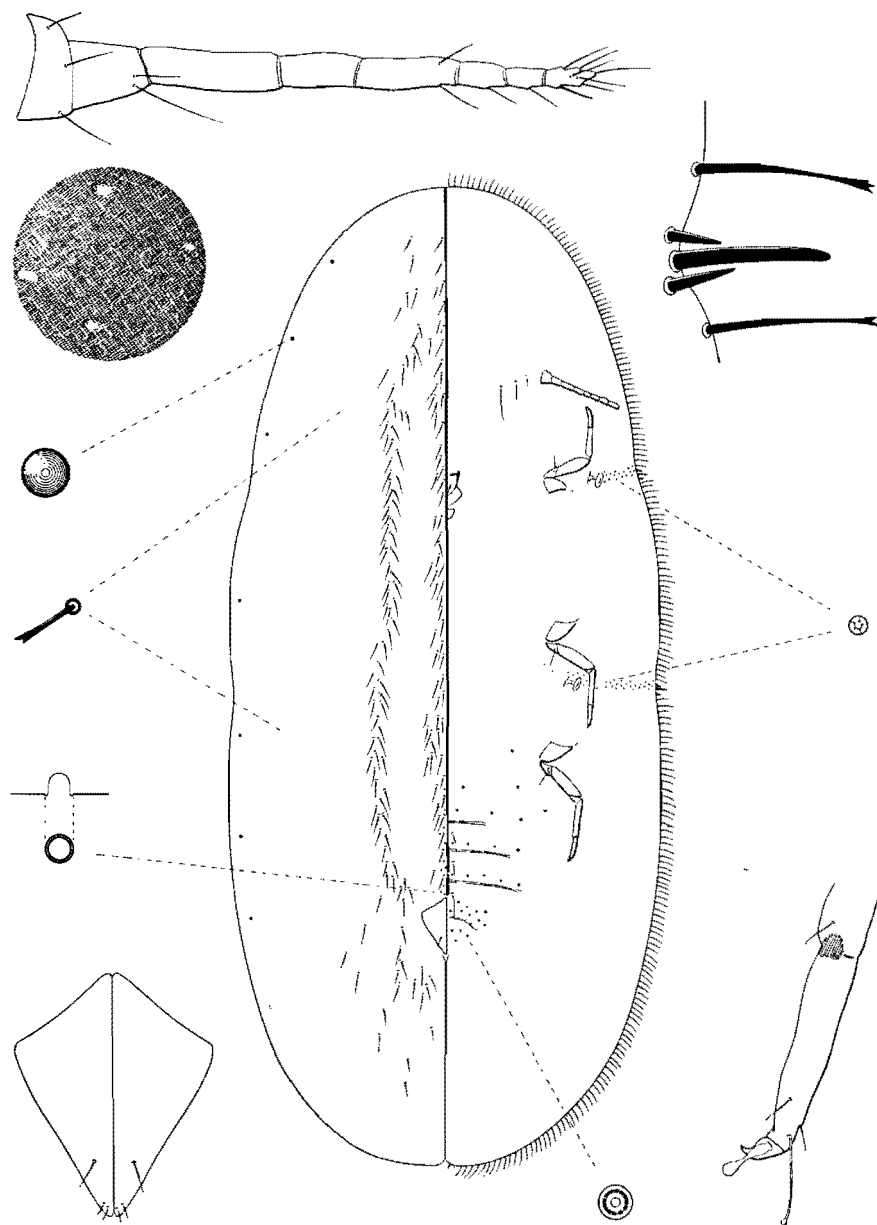


Fig. 5. *Coccus oculatus* (Brain).

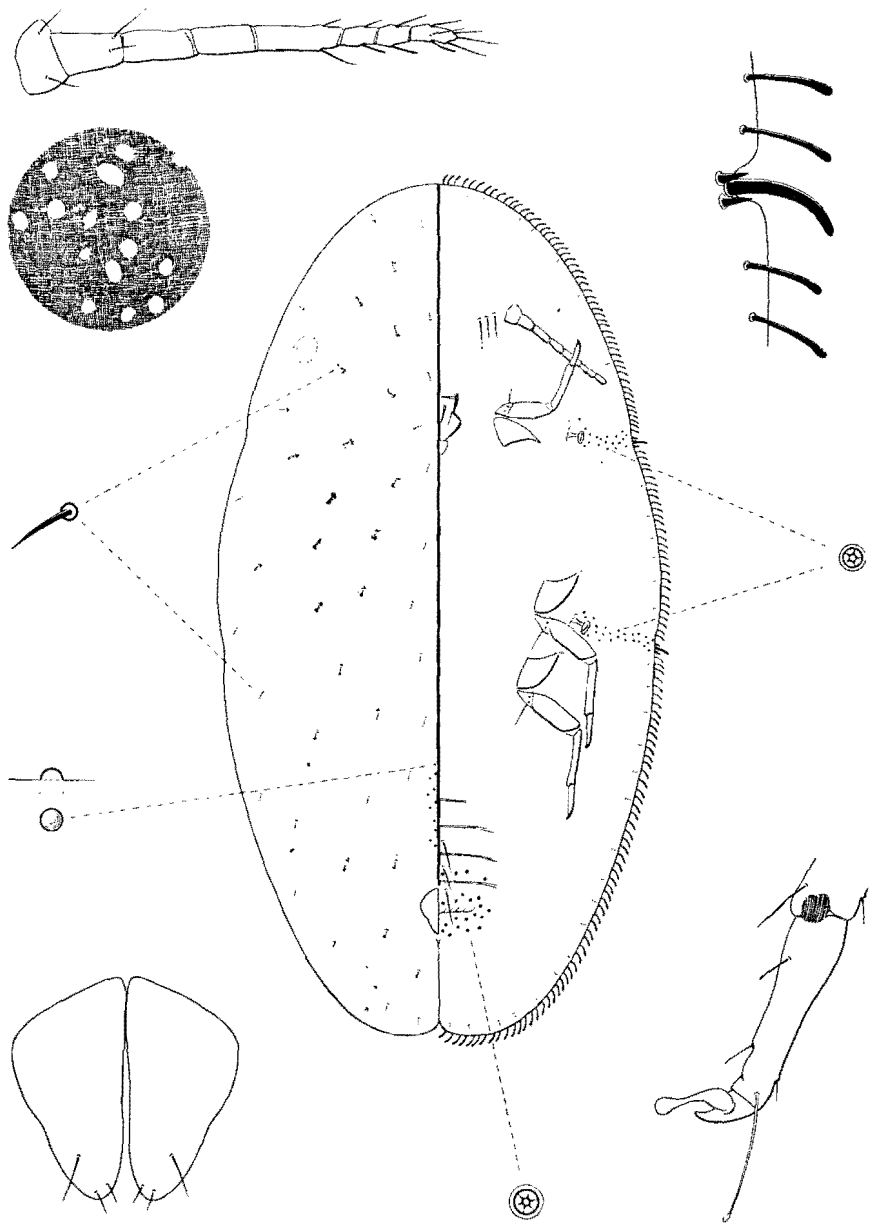


Fig. 6. *Coccus pseudelongatus* (Brain)

pointed. Anal plates together slightly longer than wide, broadly pointed posteriorly; outer angle rounded and with one subdiscal and two small apical setae. Submarginal tubercles absent. Setae of margin moderately long, set close together; all stout and slightly swollen apically. Stigmatic spines three of which median about three times as long as laterals. Ventral dermis with few multilocular disc pores about genital opening and in a transverse row on preceding segment. Quinquelocular pores arranged in an irregular band two or three pores wide. Tubular ducts absent. Antennae of 8 joints. Legs well developed and having an articular scleritis between tibia and tarsus.

SOUTH AFRICA. Pretoria: September 1914 on (?) *Acacia caffra* Willd. (C. K. Brain).

This species is known only from the original record.

***Coccus sordidus* sp.n. (fig. 7).**

Body elongate, somewhat asymmetric, flat; colour evenly brown. Mounted specimens up to 5.2 mm. long; up to 3.7 mm. wide. Dorsal dermis at full maturity slightly chitinated with small oval or circular pale areas. Dorsal setae finely pointed. Tubercle-like pores absent. Anal plates together slightly wider than long with posterior-lateral margin rounded and with four apical or subapical setae. Submarginal tubercles 5 to 7 on either side. Marginal setae rather long and slightly fimbriate apically. Stigmatic spines three; median about three times as long as laterals. Ventral dermis with multilocular disc pores about genital opening and a few arranged in rows on three preceding segments. Quinquelocular pores not numerous and set in a band two pores wide. Tubular ducts entirely absent. Antennae 8-jointed. Legs well developed with an articular scleritis between tarsus and tibia. Fold of anal invagination with four long and robust setae. Mouth parts always displaced near one of the fore legs.

KENYA. Nairobi: 12.iii.1953, 8 mounted ♀♀ collected on the upper side of leaves of *Afrormosia angolensis* (Baker) Harms (G. De Lotto).

The holotype will be deposited in due course in the British Museum (Natural History), London; one paratype in the U.S. National Collection of Coccidae, Washington, D.C.; the remainder are in the collection of the Department of Agriculture, Nairobi, Kenya.

***Coccus subacutus* (Newstead) (fig. 8).**

Known only from the original record (Newstead, 1920) and here re-described from specimens from typical material made available by the Department of Agriculture, Kampala, Uganda.

Adult female very elongate, flat; body somewhat asymmetric often distorted; colour of dried specimens evenly yellow. Length up to 3.2 mm.; breadth up to 1.5 mm. Dorsal dermis at maturity membranous. Tubercle-like

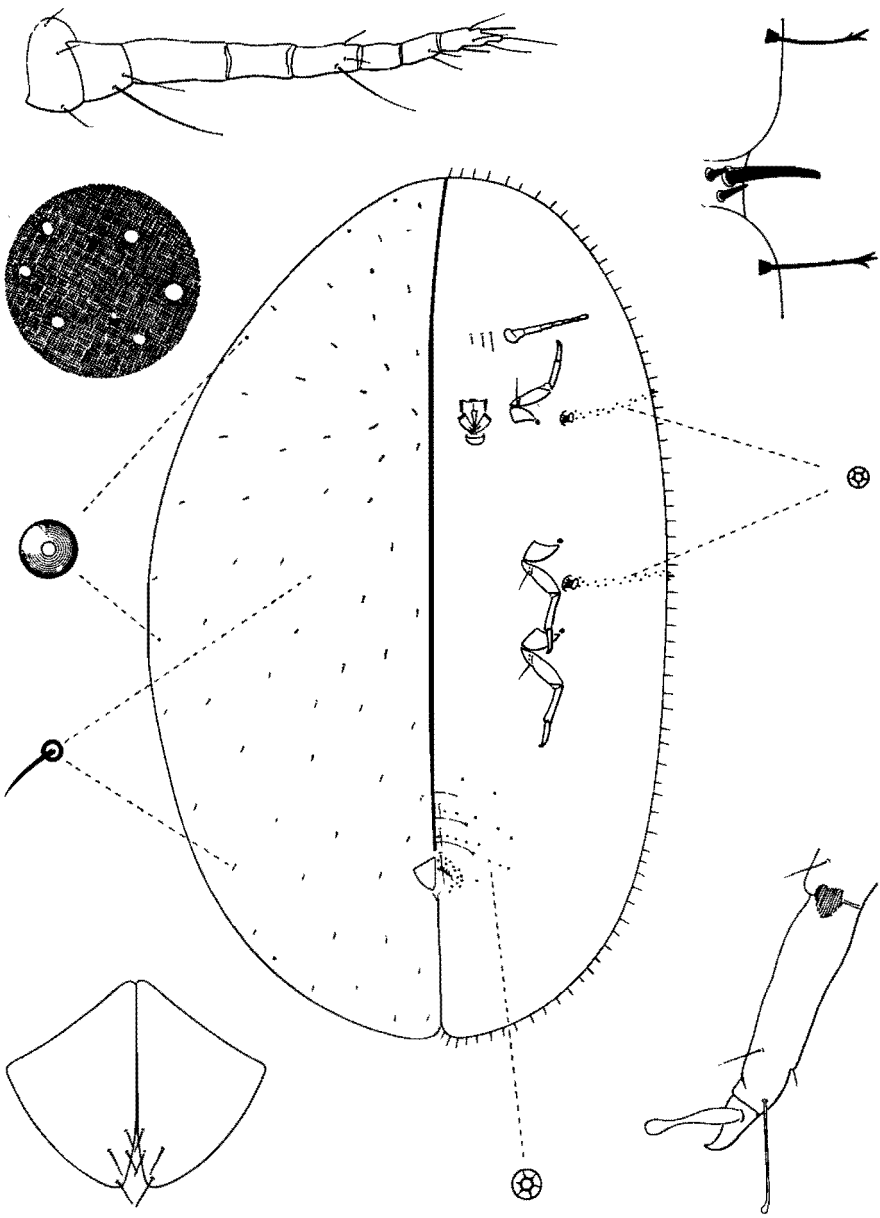


Fig. 7. *Coccus sordidus* sp.n.

pores very large, numerous and irregularly distributed on median and submedian areas in front of anal plates as far as the head. Dorsal setae cylindrical or very slightly clavate apically and uniformly scattered. Anal plates distinctly longer than their combined width, acutely pointed, with three or four apical and one discal small setae. Submarginal tubercles one to three on either side. Marginal setae set close, finely pointed at apex, curved. Stigmatic spines three; median about twice as long as laterals. Disc pores about genital opening very few and similar to those associated with stigmas. Tubular ducts few about genital opening and extending on submedian area of two preceding segments. Antennae with six joints. Legs well developed without articulatory sclerosis. Fold of anal invagination with four setae.

UGANDA. Lake Victoria, Jana Isl.: 9.x.1918 on leaves of *Coffea robusta* Lind. (C. C. Gowdey).

Coccus subhemisphaericus (Newstead) (fig. 9).

Described by Newstead (1917) from Uganda and Gold Coast on specimens attacking coffee. In view of a close resemblance of living adults with those of *Saissetia hemisphaerica* (Targioni) the species was originally assigned to the section *Saissetia* of the old genus *Lecanium*. The examination of the body structures does not support such a relationship and the species is transferred to the genus *Coccus* with which — as Newstead himself pointed out — it has more morphological affinities.

The species is here redescribed from a series of fifteen specimens collected in East Africa.

Body at full maturity strongly convex, hemispherical; surface smooth; colour dark brown. Mounted specimens circular or nearly so, measuring up to 2.5 mm. in diameter. Dorsal dermis at maturity strongly chitinized with a few very small clear areas set very widely apart and some ill-shaped deeply chitinized radiating bands on submarginal area. Few minute tubercle-like pores, with granulate surface set in front of anal plates. Dorsal setae very small, slender and finely pointed. Anal plates together wider than long, with three small apical setae. Submarginal tubercles absent. Setae of marginal fringe extremely small, set widely apart, normally bifurcate apically. Stigmatic spines three; median about one and a half times as long as laterals. Multilocular disc pores few and arranged about genital opening only. Quinquelocular pores few and set in a single line.

Tubular ducts very few about genital opening only. Antennae 7-jointed. Legs well developed with an articulatory sclerosis between tarsus and tibia. Fold of anal invagination with four setae.

The material examined was as follows:

KENYA. Machakos: 25.xi.1937 on *Coffea arabica* L. (R. H. Le Pelley); Nairobi: 20.vi.1951 on *Coffea arabica* L. (do.).

ZANZIBAR: 11.ii.1956 on clove tree (do.).

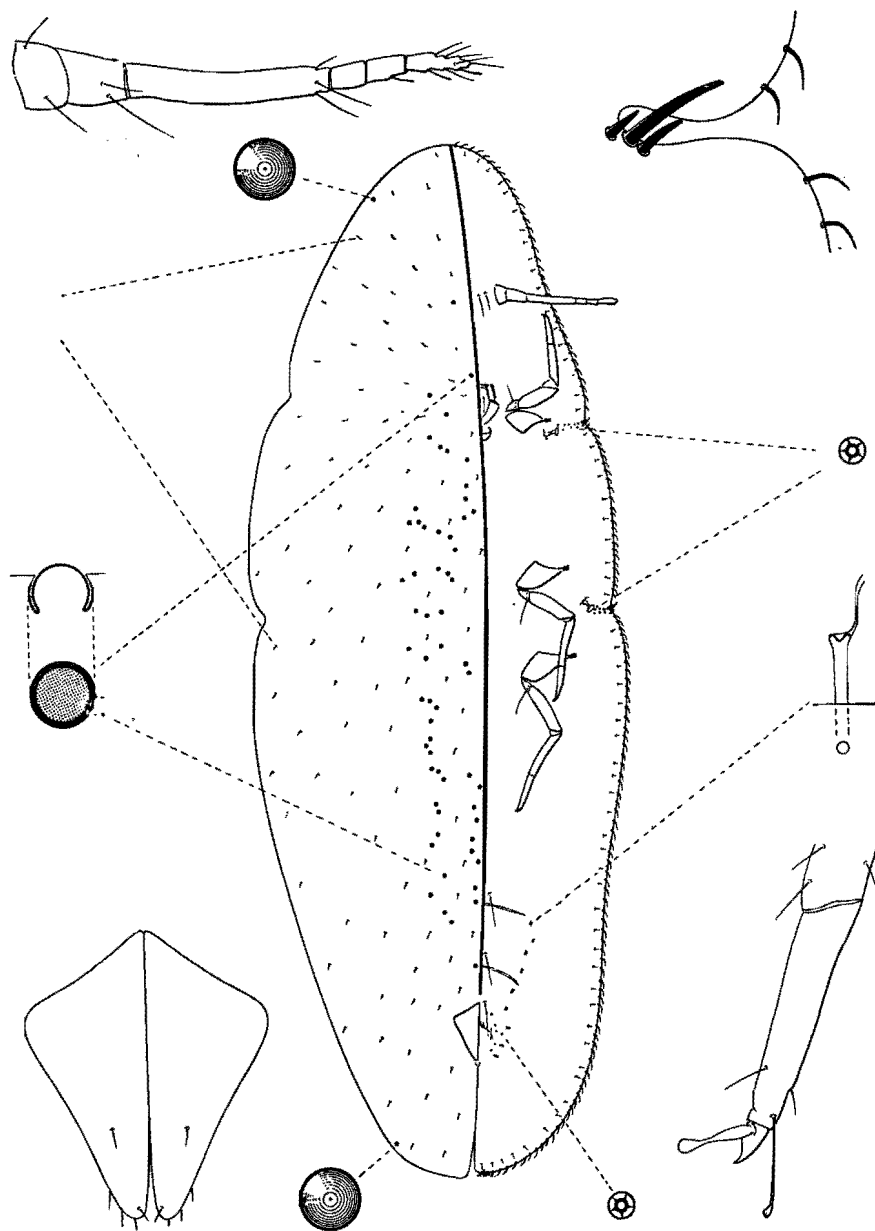


Fig. 8. *Coccus subacutus* (Newstead).

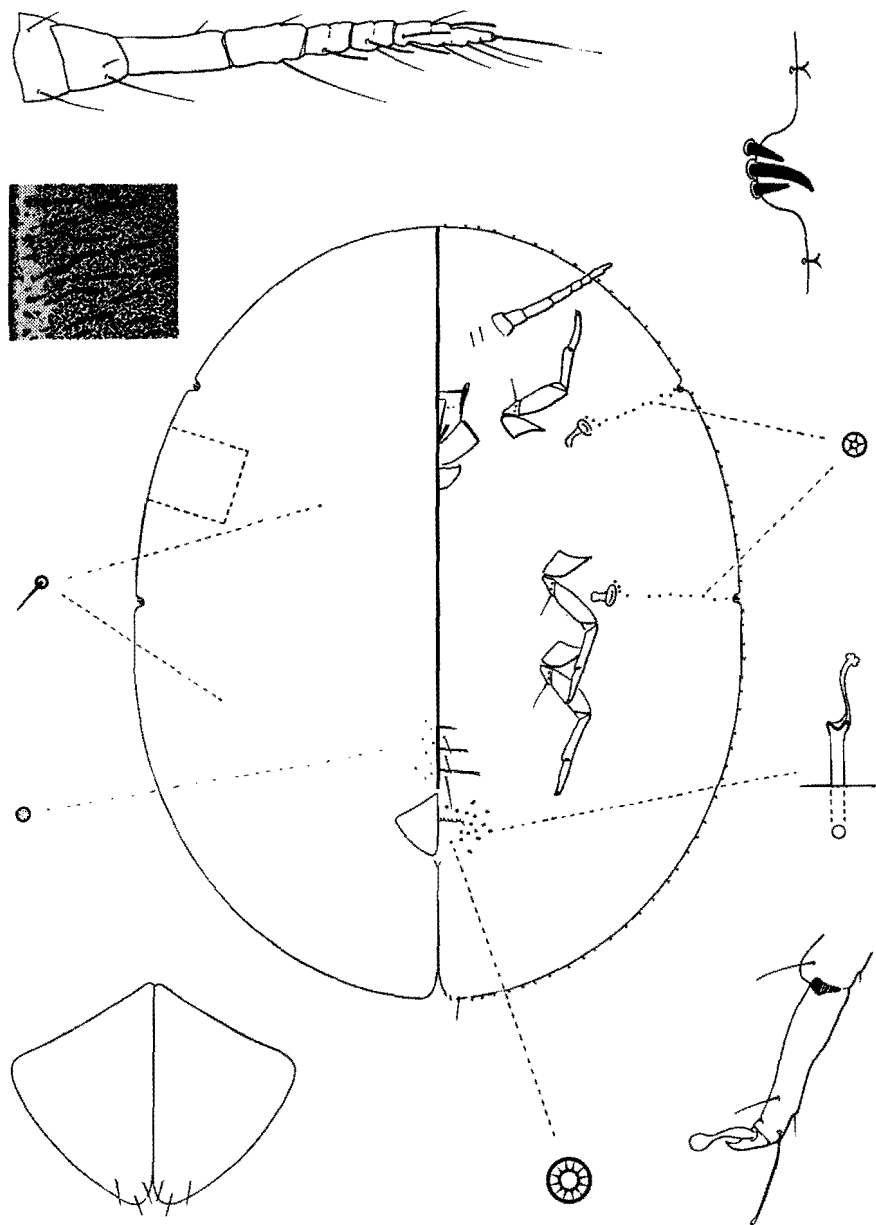


Fig. 9. *Coccus subhemisphaericus* (Newstead).

Coccus viridis (Green).

C. viridis has been recorded from many parts of the Ethiopian region as attacking several plants. In East Africa its area of distribution seems limited to the lower coastal districts and offshore islands. The material at hand agrees in every respect with Ferris' redescription and figure (*in*: Zimmerman, 1948) which are based on specimens from Ceylon identified by Green.

KENYA. Mombasa: 1.xi.1956 on *Citrus* sp. (R. H. Le Pelley).

TANGANYIKA. Maramba (near Tanga): 4.x.1956 on coffee (P. T. Walker).

ZANZIBAR: 14.ii.1956 on *Coffea robusta* Lind. (R. H. Le Pelley).

SUMMARY.

This paper discusses the identity of a small group of soft scales of the genus *Coccus* from the Ethiopian region. Two species, *acaciae* Newstead and *wistariae* Brain, are synonymized with *elongatus* (Signoret). A new species, *C. sordidus* from Kenya is also included and described.

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